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(54) Spring clutch control mechanism for a sheet feeding device

(57) The present invention relates to an automatic sheet feeding device of a printer. A pickup roller (1) picks up a record sheet from a sheet feeding plate in response to forward rotation of a driving gear (2). A first rotation member (5), during forward rotation of the driving gear, normally rotates with the pickup roller, and includes a first circumferential formation (6). A stopping member (12) is adapted to engage the first circumferential formation to arrest its forward rotation. A second rotation member (7), during forward rotation of the driving gear, normally rotates with the pickup roller, and includes a second circumferential formation (8). Continued forward rotation of the pickup roller and the second rotation member once the forward rotation of the first rotation member has been arrested by the stopping member causes the second circumferential formation to release the stopping member from the first circumferential formation, thus allowing the first and second rotation members and the pickup roller to continue their rotation in the forward direction. A mechanism is provided to prevent the pickup roller from rotating in reverse when the driving gear is rotated in reverse.

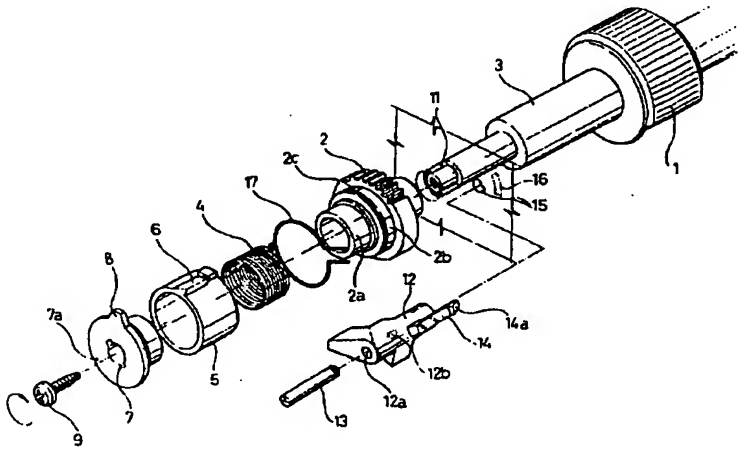

FIG. 5

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Description

BACKGROUND TO THE INVENTION

[0001] The present invention relates to an automatic sheet feeding device, for feeding sheets to a printer for example, one by one.

[0002] A printer, as shown in FIG. 1, comprises a sheet feeding station 120 for feeding record sheets into the printer, a paper transporting station 150 for transporting the sheets fed from the sheet feeding station 120 to the painting position, a printing station 140 for printing data onto the sheet transported by the transporting station 150 and a sheet discharging station 160 for discharging the sheet printed by the printing station 140, the printing station 140 is installed on a main board 112 mounted within a case 111.

[0003] The printing station 140 comprises at least one ink head 142 having nozzles (not illustrated) to jet ink and a carriage 141 for carrying the ink head 142. The ink head 142 is mounted on the carriage 141, carries out printing of the data by jetting ink through nozzles on the sheet transported by the sheet transporting station 150 while being moved according to the left and right movement of the carriage 141.

[0004] The sheet feeding station 120 comprises a sheet feeding plate 122 in which a number of sheets 100 are loaded and a semicircular pickup roller 124 for picking up the sheet 100 loaded in the sheet feeding plate 122 and transporting it to the sheet transporting station 150. When the sheets are loaded on the sheet feeding plate 122 to be fed to the printer, the sheets loaded on the sheet feeding plate 122 are pressed upwardly by the spring force of a sheet feeding spring 119 positioned between an upper portion of the frame 121 and a lower portion of the sheet feeding plate 122. The uppermost sheet 100 is contact with the pickup roller 124 and picked up by rotation of the pickup roller 124. The sheets 100 picked up by the pickup roller 124 basses through a path between a friction roller 151 and a feed roller 152 located at the sheet transporting station 150 along a feeding path and are transported to the printing position by the rotation of the friction roller 151 and the feed roller 152.

[0005] When the sheet arrived at the sheet discharging station 160 after passing through a base from 161, the sheet is discharged out of the printer by the rotation of a sheet contacting wheel 162 and a sheet discharging roller 163 located at the sheet discharging station 160.

[0006] The feed roller 152, which transports the sheet to the printing position in cooperation with the friction roller 151, is engaged with a gear 126 mounted on a motor 125 through a gear 128, which is mounted on a shaft of the feed roller 152 and in turn a pinch gear 127 and is rotated by the driving of a motor 125. In addition, the driving force of the motor 125 is transferred to the pickup roller 124 through a gear 129 which is mounted on a pickup shaft.

[0007] The driving force of the motor 125 is transferred to the gear 129 through an idle gear 132, the rotation of the gear 129 is transferred to the pickup roller 124 when the motor 125 is driven in the forward direction, but is not transferred to the pickup roller 124 when the motor 125 is driven in the reverse direction, by a one-way clutch. And the sheet feeding plate 122 is operated by the action of a cam 135 being mounted on a cam roller 134. The cam roller 134 is rotated by the driving force of the motor 125 transferred through the idle gears 132, 133.

[0008] In the conventional sheet feeding station 120 being driven as described above, when the motor 125 is driven in a forward direction (in which the sheet 100 is picked up by the pickup roller 124), the sheet feeding plate 122 is lifted up by the action of the cam 135 by the rotation of the cam roller 134, to which the driving force is transferred from the pinch gear 127 through the idle gears 130 to 133, so that the uppermost sheet is contacted with the pickup roller 124 and the driving gear 129 is driven in the forward direction so that the uppermost sheet can be picked up to transport it to the feed roller 152 by the semicircular pickup roller 124.

[0009] When the pickup roller 124 is positioned as shown in FIG. 2, while the sheet is picked up by the pickup roller 124 and transported toward the feed roller 152, the position of the pickup roller 124 is sensed by a sensor 136 and the motor 125 is driven in reverse according to the signal of the sensor 136 during a predetermined time and the feed roller 152 is driven in reverse by the reverse rotation of the motor 125. When the motor 125 is driven in reverse, the reverse rotation of the pickup roller 124 is prevented by the interruption of the driving force of the motor 125 by the action of the one-way clutch. Accordingly, the sheet 100 is curled by the reverse rotation of the feed roller 152 as illustrated in FIG. 2. The object of this reverse rotation of the feed roller 152 is to align the leading end of the sheets 100 (the end part of the sheet toward the printer) in order to prevent printing error which may occur when the sheets 100 are not aligned.

[0010] As the pickup roller 124 is rotated again after the reverse rotation of the feed roller 152 is finished, the sheet is fed from the pickup roller 124 to the feed roller 152 and at the same time the picking up from the pickup roller 124 is finished and the sheet 100 can be aligned precisely.

[0011] The motor 125 can be rotated in reverse by the sensing signal of the sensor 136, as above described, but this matter for rotating the motor 125 in reverse direction using the sensor 136 requires a complicated device, thus a ratchet wheel 252 and a ratchet 248 have been employed for use in rotating the motor 125 in reverse without using the sensor.

[0012] The one-way clutch for preventing the reverse rotation of the pickup roller 124 and the structure for during the motor 125 in reverse at a proper time are

illustrated approximately in FIG. 3.

[0013] As shown in FIG. 3, the driving gear 129, which transfers the driving force of the motor 125 to the pickup roller 124 through the pickup shaft 241, is mounted on a pickup shaft 241, on a side of the driving gear 129, there are formed a first cylindrical portion 291 having a large diameter and a second cylindrical portion 292 having a small diameter. The first cylindrical portion 291 has a groove 246a formed along the circumference direction. In addition, a pushing member 247 having a right shape, to each end of which a protrusion 247a is provided, is received in the groove 246a. And the second cylindrical portion 292 is extended from the first cylindrical portion 291 to the outside of the pickup shaft 241.

[0014] A spring clutch 251, like illustrated in FIG. 3, is mounted on the outer circumference of the second cylindrical portion 292, the spring clutch 251 is made of a coil spring being wound in the reverse rotation direction of the pickup shaft 241. One end 251a of the spring clutch 251 is fixed to the gear 129 or a ratchet wheel 252 and the other end is fixed to a recess 257 formed in a hub 254 and the hub 254 is fixed to the end surface of the pickup shaft 241 by a fastener 258 such as a bolt.

[0015] The one end portion of the ratchet wheel 252 is apart from the end portion of the first cylindrical portion 291 by a predetermined distance by the hub 254 and the ratchet wheel 252 is mounted so as to enclose the spring clutch 251 mounted on the cylindrical portion 292. The ratchet wheel 252 has a notch 253 formed in the one side as shown in FIG. 3, this notch 253 is engaged with a ratchet 248 of the ratchet member 250 being pivotally mounted to a hole 244 formed in the sheet feeding station 120.

[0016] At the same time as the ratchet member 250 is pivotally mounted by a pin 250a in the hole 244 formed on the sheet feeding station 120, a claw member 249 is provided near the mounting location of the pin 250a and the claw member 249 is inserted into a fan-shaped hole 245 formed in the sheet feeding station 120. Accordingly, when the ratchet member 250 is pivoted about the pin 250a, the claw member 249 is guided along the fan-shaped hole 245. When the ratchet member 250 is mounted on the sheet feeding station 120, the ratchet member 250 from the sheet feeding station 120 can be prevented from separating, as a claw 249a formed in the end portion of the claw member 249 is caught on the hole 245.

[0017] The ratchet member 250 is provided with a protrusion 248a being protruded toward the sheet feeding station 120, the protrusion 248a is positioned between protrusions 247a of the pushing member 247 when the ratchet member 250 is mounted on the sheet feeding station 120.

[0018] As the one-way clutch is constructed as described above, when the pickup roller 124 is rotated in the forward direction by the rotation of the driving gear 129, the spring clutch 257 pulls the hub 254 to closely contact the one end portion surface of a ratchet wheel 255 with the first cylindrical portion 291a of the driving gear 129 and then the driving gear 129 is closely contacted with the pickup shaft 241, so that the driving force of the driving gear 129 is transferred to the pickup roller 124. Put another way, the spring clutch tightens onto the second circumferential part 292 of the driving gear 129 and the corresponding part of the hub 254. Thus driving engagement between the driving gear 129 and the hub 254 is ensured. The ratchet wheel is also driven, by virtue of being affixed to one end of the spring 251. When the pickup roller 124 is continuously rotated and positioned in the place and then the notch 253 of the ratchet wheel 252 is engaged with the ratchet 248, as shown in FIG. 4A, the motor 125 is rotated in reverse for aligning the sheet 100 and the feed roller 152 is rotated in reverse by the reverse rotation of the motor 125 as shown in FIG. 2.

[0019] The reverse driving force of the motor 125 is transferred to the driving gear 129 through a number of gears, whereby the driving gear 129 also is rotated in reverse. As the driving gear 129,a the pickup shaft 241 are released from the close contact to the driving gear 129 by loosening of the coil of the spring clutch 251. When the driving gear 129 is rotated in reverse, the reverse rotation force of the driving gear 129 is not transferred to the pickup roller 124 by the spring clutch 251 as above described. Here, because the reverse rotation is run for a short time, reverse rotation of the pickup roller 124 caused by the deformation of the spring clutch 257 does not take place.

[0020] In other words, since the spring clutch 251 is wound in the reverse rotation direction of the driving gear 129, when the driving gear 129 is rotated forward, the ratchet wheel 252 is rotated in the same direction as the rotation direction of the driving gear 129. However, since the ratchet wheel 252 is apart from the driving gear 129 by the action of the spring clutch 251 when the driving gear 129 is rotated in reverse, the driving force of the driving gear 129 is not transferred to the ratchet wheel 252. And so the ratchet wheel 252 comes to a still stand, restrained for example by being connected to the spring 251.

[0021] In the mean time, when the driving gear 129 is rotated in reverse, the pushing member 247, which is mounted on the groove 246a of the first cylindrical portion 291 of the driving gear 129, comes to be rotated together with the driving gear 129. Therefore, as the ratchet 248, a protrusion 248a of which is positioned between the protrusions 247a of the pushing member 247, is rotated by the protrusions 247a of the pushing member 247 in an arrow direction of FIG. 4B, the ratchet 248 gets positioned in the position of releasing from the combination with the notch 253 of the ratchet wheel 252 as shown in FIG. 4B.

[0022] In the state as shown in FIG. 4B, when the driving motor 125 is rotated forward, the leading end of the sheet 100 is formed in line by the rotation of the pickup roller 124 and the pickup roller 124 is continuously

rotated and transports the sheet 100 formed in line to the feed roller 152. Besides, the ratchet wheel 252, which is rotated together with the pickup roller 124, can be rotated without the notch 253 being engaged with the ratchet 248 as shown in FIG. 4C.

[0023] At this time, the sheet feeding plate 122 is operated by the cam mounted on the cam roller 134 and when a circular portion of the cam 135 is contacted with a movable member 134 connected to the sheet feeding plate 122, the sheet feeding plate 122, as shown in FIG. 1, is pressed by a sheet feeding place spring 119 toward the pickup roller 124 so as to feed the sheet to the printer and so brings the pickup roller 124 into contact with the sheet 100.

[0024] When the sheet 100 is fed to the printer by pickup roller 124 as shown in FIG. 4C, the sheet feeding plate 122 is apart from the pickup roller 124 against the sheet feeding plate spring 119. The operation cycle of this time is in printing or in a standby status for feeding the sheet.

[0025] As described above, the automatic sheet feeding device of the conventional printer has a structure to drive the pickup roller after bringing the ratchet in a predetermined distance apart from the position of the combination with the notch of the ratchet wheel using the reverse rotation of the feed roller in order to prevent the restraint of the rotation of the pickup roller due to the combination of the ratchet with the notch of the ratchet wheel when the pickup roller is rotated forward to feed the sheet after the reverse rotation of the feed roller.

[0026] However, in the above described automatic sheet feeding device of the conventional printer, when the pickup roller is rotated forward to feed the sheet when the ratchet is not sufficient far apart from the position of the combination with the notch of the ratchet wheel, the rotation force of the pickup roller is transferred to the spring clutch and so the spring clutch becomes transformed and therefore the feeding operation cannot be accurately accomplished.

[0027] Further, when the feed roller is rotated in reverse, torque is acted to the pickup roller by the friction force of the spring clutch etc. and the pickup roller also may be rotated in reverse by this torque. In this case, as the distance between the ratchet and the notch is changed, the notch of the ratchet wheel becomes engaged with the ratchet when the pickup roller is rotated forward to feed the sheet and so the pickup roller cannot be rotated. Therefore, it happens, that the sheet cannot be fed to the printer.

SUMMARY OF THE INVENTION

[0028] Accordingly, it is an object of the present invention to provide an improved automatic sheet feeding device.

[0029] Accordingly, one aspect of the present invention provides an automatic sheet feeding device comprising:

a pickup roller for picking up a record sheet from a sheet feeding plate in response to forward rotation of a driving gear; and

means for restraining forward rotation of the pickup roller, to mark the time for alignment of the leading edge of a record sheet being fed, and then to release the pickup roller to allow its forward motion to continue.

[0030] The said means may comprise:

a first rotation member that, during forward rotation of the driving gear, normally rotates with the pickup roller, and including a first circumferential formation;

a stopping member adapted to engage the first circumferential formation on the first rotation member to arrest its forward rotation; and

a second rotation member that, during forward rotation of the driving gear, normally rotates with the pickup roller, and including a second circumferential formation;

the device being such that continued forward rotation of the pickup roller and the second rotation member once the forward rotation of the first rotation member has been arrested by the stopping member causes the second circumferential formation on the second rotation member to release the stopping member from the first circumferential formation on the first rotation member, thus allowing the first and second rotation members and the pickup roller to continue their rotation in the forward direction.

[0031] Preferably, during forward rotation of the driving gear, the first circumferential formation on the first rotation member is normally in advance of the second circumferential formation on the second rotation member by approximately 3 degrees.

[0032] The device may further comprise a switching member that normally rotates with the driving gear and is adapted to release the stopping member from the first circumferential formation on the first rotation member, when the driving gear is rotated in reverse.

[0033] According to a second aspect of the present invention, there is provided an automatic sheet feeding device comprising:

a pickup roller for picking up a record sheet from a sheet feeding plate in response to forward rotation of a driving gear; and

means for preventing the pickup roller from rotating in reverse when the driving gear is rotated in reverse

[0034] The means for preventing the pickup roller from rotating in reverse may comprise:

a toothed member on the pickup roller and provided

with a cam for pressing the sheet feeding plate;
a stopper lever having a number of teeth adapted to engage the toothed member to prevent the pickup roller from rotating in reverse; and
means for biasing the stopper lever into contact with the toothed member.

[0035] The device may further comprise a sheet feeding plate actuator for reciprocating the sheet feeding plate in association with the operation of the pickup roller.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0036] The present invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic sectional view illustrating the operation for feeding sheet to a printer by a conventional automatic sheet feeding device,
FIG. 2 is a diagrammatic sectional view illustrating the operation for feeding sheet to a printer by an automatic sheet feeding device shown in FIG. 1 when the feed roller is rotated in reverse,
FIG. 3 is a exploded perspective view illustrating the structure of the one-way clutch being mounted on the pickup shaft to cut and connect the driving force to the pickup roller when the feed roller is rotated in reverse,
FIG. 4A or FIG. 4C is a view illustrating the operating state of the mechanism for restraining or releasing the rotation of the pickup roller in the one-way clutch illustrated in FIG. 3,
FIG. 5 is a diagrammatic exploded perspective view illustrating the structure of the one-way clutch according to the present invention,
FIG. 6A or FIG. 6C is a view illustrating the operating state of the mechanism for restraining or releasing the rotation of the pickup roller in the one-way clutch illustrated in FIG. 5,
FIG. 7 is a diagrammatic perspective view of the mechanism for preventing the reverse rotation of the pickup roller according to the present invention,
FIG. 8 is a diagrammatic side view illustrating the state, how the reverse rotation of the pickup roller is prevented by the mechanism for preventing the reverse rotation of the pickup roller, from the direction of the pickup roller.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0037] As illustrated in FIG. 5, a driving gear 2 is mounted on a pickup shaft 3 and rotates a pickup roller 1, which is mounted on the pickup shaft 3, in a forward direction by a forward direction driving of a motor (not illustrated) as described above. The pickup roller 1 picks up a sheet, which is loaded on a sheet feeding plate by the forward rotation of the driving gear 2 and feeds the sheet to a printer.

[0038] The driving gear 2 is provided with a first cylindrical portion 2a extending a little distance toward an end portion of the pickup shaft 3. And a spring clutch 4, which is wound by the reverse rotation of the pickup roller 1 in a same manner as the conventional automatic sheet feeding device, is positioned in the first cylindrical portion 2a. The spring clutch 4 is fixed to a groove 7a of a hub 7, one end portion 4a of which is fixed to the driving gear 2 and the other end portion 4b is fixed to an end portion of the pickup shaft 3.

[0039] The hub is fixed to an end 11 of the pickup shaft 3 by a fastener 9 such as a bolt. When the hub 7 is fixed to the pickup shaft 3, a ratchet wheel 5, which is positioned to cover the spring clutch 4 positioned in the first cylindrical portion 2a of the driving gear 2, is closely contacted to the driving gear 2 by the hub 7. A notch 6 is engaged with a ratchet 12, which is pivotally mounted on the side of the sheet feeding station when the pickup shaft 3 is rotated. At this time, the motor stops driving forward according to a sensing means such as a sensor or a predetermined program and is rotated for rotating a feed roller (not illustrated) in reverse so as to form the sheet in line.

[0040] In the mean time, as mentioned in the explanation of the conventional techniques, at the same time as a pin 13 is pivotally inserted through a hole 12a of the ratchet 12 into a hole 15 formed in the sheet feeding station, a clay member 14 offered near the hole 12a penetrated by the pin 13 is inserted into a fan-shaped hole 16 formed in the sheet feeding station. Accordingly, when the ratchet 12 is rotated centring around the pin 13, the claw member 14 can be rotated along the fan-shaped hole 16. When the ratchet 12 is mounted on the sheet feeding station, a claw 14a formed on end of the clay member 14 gets caught on the hole 16 and is the secession of the ratchet 12 from the sheet feeding station can be prevented.

[0041] Such ratchet wheel 5 and ratchet 12 construct a mechanism for restraining the rotation determining a point of time for reverse rotation of the driving gear 2. Meanwhile, when the driving gear 2 stops rotating in reverse, a protrusion 8 formed on the hub 7 has a function of the mechanism for releasing the rotation restraint of the ratchet wheel 5 by the ratchet wheel 5 and the ratchet 12 (the mechanism for restraining the rotation of a pickup roller).

[0042] In this mechanism for releasing the rotation restraint, the protrusion 8 formed on the hub 7 is positioned in a predetermined angle, about angle of 3 degrees backward from the notch 6 in a forward rotation direction of the pickup roller 1 and is formed in higher position than the notch 5 so as to push out the ratchet 12 in order that the combination of the ratchet 12 with the notch 6 can be released from the combination posi-

tion.

[0043] Therefore, as illustrated in FIG. 6A-6C, when the pickup roller 1 is driven in the forward direction by the driving gear 2, the ratchet 12 is engaged with the notch 6 of the ratchet wheel 5 and the rotation of the pickup roller 1 is restrained as illustrated in FIG. 6A, then the motor, as shown in FIG. 2, is rotated in reverse so as to form the sheet in line by the reverse rotation of the feed roller. At this time, the explanation of the structure for preventing the reverse rotation of the pickup roller 1 may be omitted because it has been described previously.

[0044] If the arrangement of the sheet by the reverse rotation of the motor for a predetermined time is completed, the pickup roller 1 is rotated forward, as shown in FIG. 6B, by the forward direction driving of the motor, in the state that the notch 6 of the ratchet wheel 5 mounted on the pickup shaft 3, as shown in FIG. 6A, is engaged with the ratchet 12. At this time, because the notch 6 of the ratchet wheel 5 is engaged with the ratchet 12, the hub 7 mounted on the pickup shaft 3 is rotated by the rotation of the pickup shaft 3 and here the force is applied to the spring clutch 4 in the loosening direction of the coil.

[0045] When the hub 7 is rotated in a predetermined angle, that is, in an angle of about 3 degrees according to the rotation of the pickup shaft 3, the protrusion 8 formed on the outer circumference of the hub 7 comes in contact with the ratchet 12 and the ratchet 12 is pushed out by the contact with the protrusion 8 so as to be released from the combination with the notch 5 and so the ratchet wheel 5 becomes rotated together with the pickup shaft 3, namely the pickup roller 1.

[0046] At this time, the force is applied to the spring clutch 4 in the loosening direction of the coil according to the rotation of the hub 7. However, because the loosening quantity of the coil is very little, the spring clutch 4 is not transformed and the driving force of the driving gear 2 can be continuously transferred to the pickup roller 1.

[0047] Further, in the automatic sheet feeding device of the printer according to the present invention, when the driving gear 2 is rotated in reverse, a pushing member 17, to each end of which protrusions 17a, 17b, which push out the ratchet 12 from the combining position with the notch 5 of the ratchet wheel 7, are offered, can be mounted on the driving gear 2 as in a conventional case.

[0048] The explanation of such pushing member 17 may be omitted as it has been described in detail previously. Likewise, as the pushing member 17 is offered to the driving gear 2, the deformation of the spring clutch 4 can be prevented doubly.

[0049] Besides, the automatic sheet feeding device of the printer according to the present invention can be provided desirably with a means for preventing the pickup roller 1 from rotating in reverse, as shown in FIG. 7 and FIG. 8, in order to prevent the reverse rotation of the pickup roller 1 when the driving gear 2 is rotated in reverse.

[0050] Referring to FIG. 7 and FIG. 8, the means for preventing the pickup roller 1 from rotating in reverse can be described as follows. In the means for preventing the pickup roller 1 from rotating in reverse, a ratchet wheel member 18 is positioned on the other end portion of the pickup shaft 3, to which the cam 23 is offered within the scope of the angle, in which the pickup roller 1 becomes apart from the sheet feeding plate. And in the ratchet wheel member 18, the outer diameter is formed in semicircular shape centring around the pickup shaft 3 and a number of the teeth of a saw 19a of the pickup roller 1 are formed in the outer diameter.

[0051] The ratchet wheel member 18 prevents the reverse rotation of the pickup roller 1 in cooperation with a stopper lever 20 being pivotally mounted on the sheet feeding station 21 and the stopper lever 20 has a same inner diameter as the outer diameter of the ratchet wheel 18 and the inner diameter is provided with a number of the teeth of a saw 18a being engaged with the teeth of a saw 20a formed on the ratchet wheel member 18.

[0052] These teeth of saws 18a, 20a are formed so as to prevent the reverse rotation of the pickup roller 1 when they are engaged with each other and they are formed to be easily engaged when the ratchet wheel member 18 is rotated to be contacted with the stopper lever 20. Because the stopper lever 20 is pressed toward the ratchet wheel member 18 by the spring 23, the teeth of saws 18a, 20a can be engaged easily and surely with each other when the ratchet wheel member 18 approaches to the stopper lever 20 by the rotation of the pickup shaft 3.

[0053] As shown in FIG. 8, when the motor becomes driven in reverse in the state that the teeth of saws 18a, 20a are engaged with each other, the reverse rotation of the pickup roller 1 is surely prevented by the mechanism for preventing the reverse rotation even though the reverse rotation force of the motor is transferred to the pickup roller 1.

[0054] As described above, according to the automatic sheet feeding device of the present invention, as the rotation force of the pickup shaft due to the reverse rotation of the pickup shaft is surely prevented from being transferred to the spring clutch in the state that the ratchet is engaged with the notch after the arrangement of the sheet is completed by the reverse rotation of the motor, the obstacle of the sheet feed due to the deformation of the spring clutch caused by the rotation force of the pickup shaft can be prevented.

[0055] Furthermore, even though the reverse rotation force of the motor is transferred to the pickup shaft at the time of the reverse rotation of the motor by the mechanism for preventing the reverse rotation of the pickup roller as described above, the obstacle of the sheet feed caused by the reverse rotation of the pickup roller can be prevented by the sure prevention of the

reverse rotation of the pickup roller.

Claims

1. An automatic sheet feeding device comprising:

   a pickup roller for picking up a record sheet from a sheet feeding plate in response to forward rotation of a driving gear; and
   means for restraining forward rotation of the pickup roller, to mark the time for alignment of the leading edge of a record sheet being fed, and then to release the pickup roller to allow its forward motion to continue.

2. A device according to claim 1 in which the said means comprises:

   a first rotation member that, during forward rotation of the driving gear, normally rotates with the pickup roller, and including a first circumferential formation;
   a stopping member adapted to engage the first circumferential formation on the first rotation member to arrest its forward rotation; and
   a second rotation member that, during forward rotation of the driving gear, normally rotates with the pickup roller, and including a second circumferential formation;
   the device being such that continued forward rotation of the pickup roller and the second rotation member once the forward rotation of the first rotation member has been arrested by the stopping member causes the second circumferential formation on the second rotation member to release the stopping member from the first circumferential formation on the first rotation member, thus allowing the first and second rotation members and the pickup roller to continue their rotation in the forward direction.

3. A device according to claim 2 in which, during forward rotation of the driving gear, the first circumferential formation on the first rotation member is normally in advance of the second circumferential formation on the second rotation member by approximately 3 degrees.

4. A device according to claim 3 further comprising a switching member that normally rotates with the driving gear and is adapted to release the stopping member from the first circumferential formation on the first rotation member, when the driving gear is rotated in reverse.

5. A device according to any preceding claim, further comprises means for preventing the pickup roller from rotating in reverse when the driving gear is rotated in reverse.

6. An automatic sheet feeding device comprising:

   a pickup roller for picking up a record sheet from a sheet feeding plate in response to forward rotation of a driving gear; and
   means for preventing the pickup roller from rotating in reverse when the driving gear is rotated in reverse

7. A device according to claim 5 or claim 6, in which the means for preventing the pickup roller from rotating in reverse comprises:

   a toothed member on the pickup roller and provided with a cam for pressing the sheet feeding plate;
   a stopper lever having a number of teeth adapted to engage the toothed member to prevent the pickup roller from rotating in reverse; and
   means for biasing the stopper lever into contact with the toothed member.

8. A device according to any preceding claim further comprising a sheet feeding plate actuator for reciprocating the sheet feeding plate in association with the operation of the pickup roller.

9. An automatic sheet feeding device as illustrated in FIGs. 5 et seq. of the accompanying drawings.

FIG. 1 (PRIOR ART)

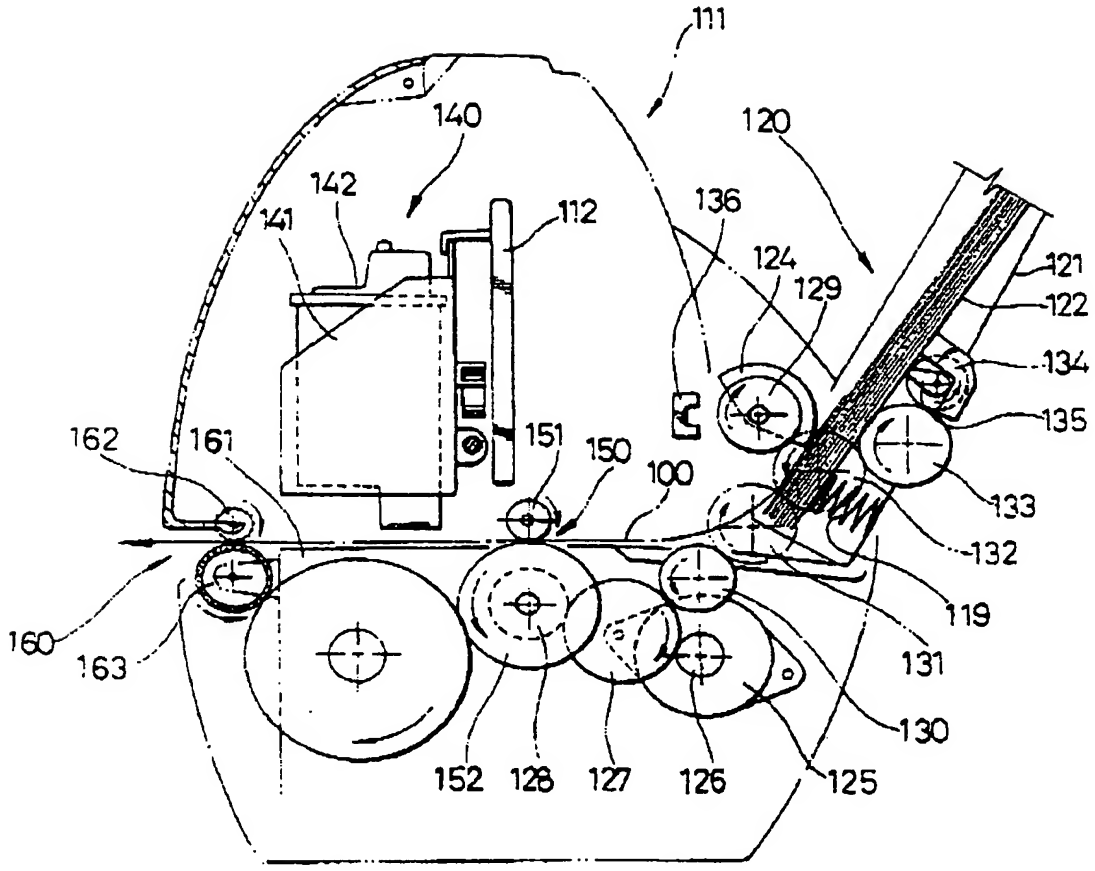


FIG. 2 (PRIOR ART)

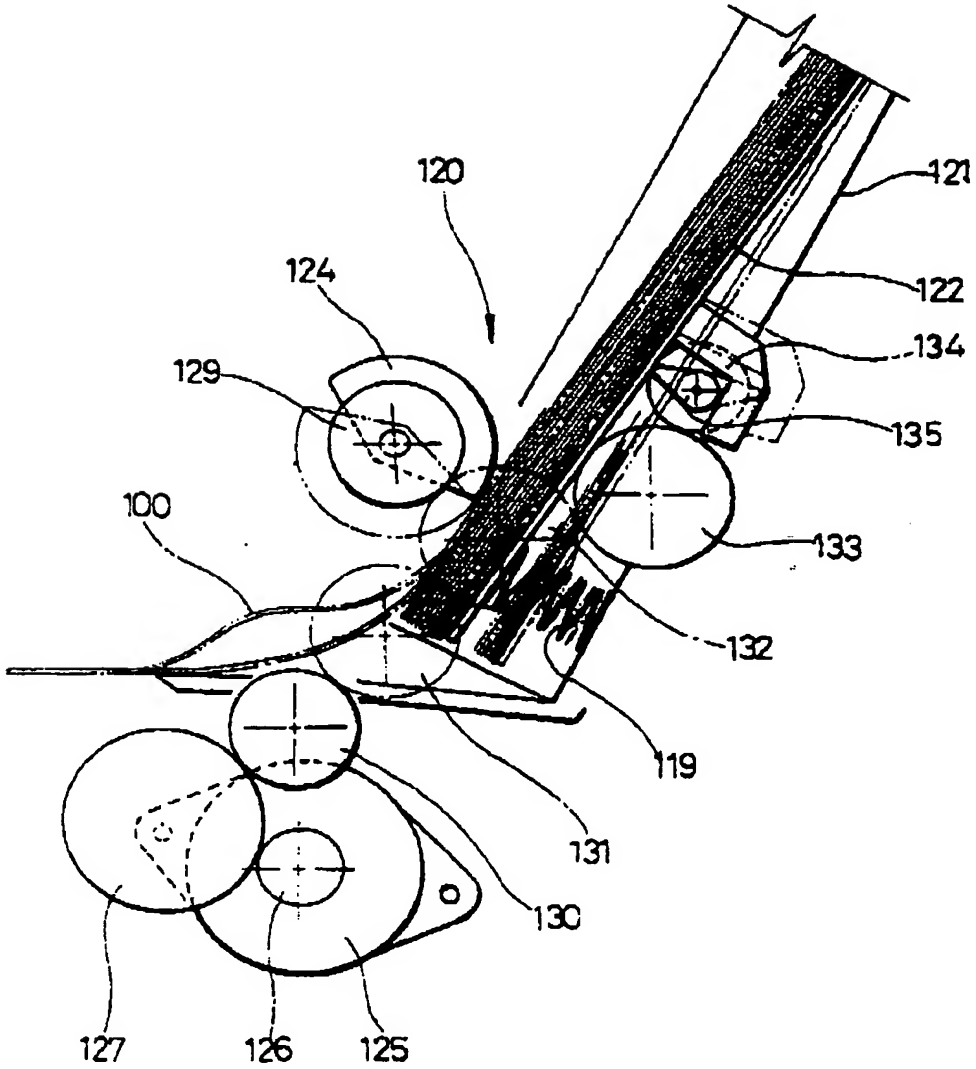


FIG. 3 (PRIOR ART)

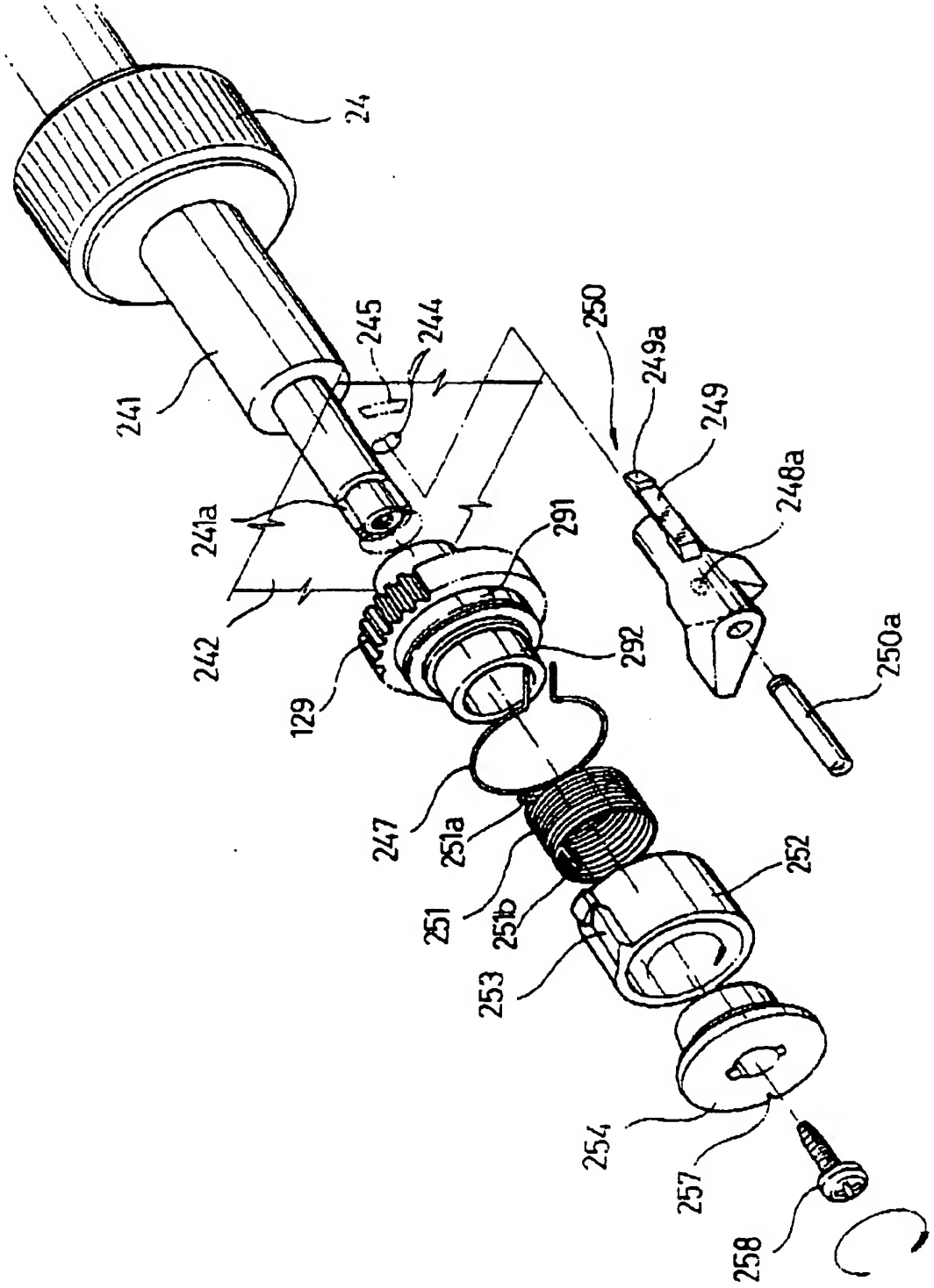


FIG. 4A
(PRIOR ART)

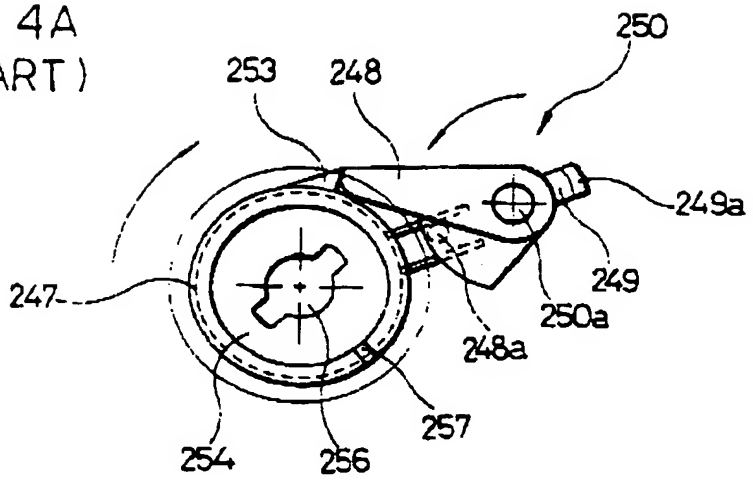


FIG. 4B
(PRIOR ART)

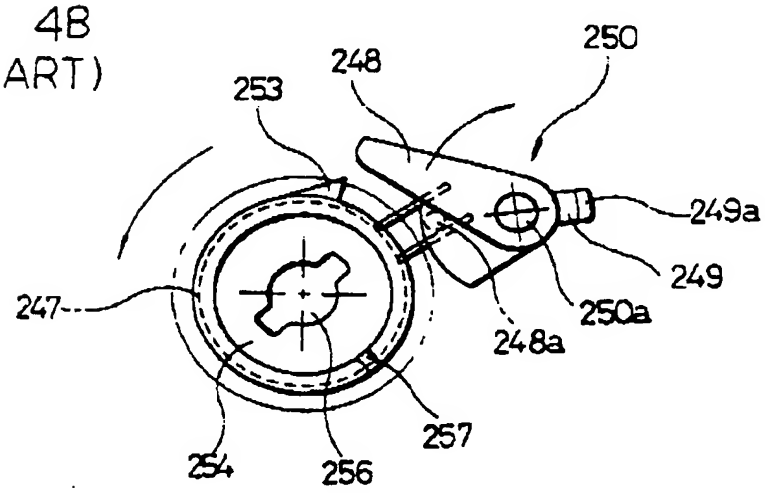


FIG. 4C
(PRIOR ART)

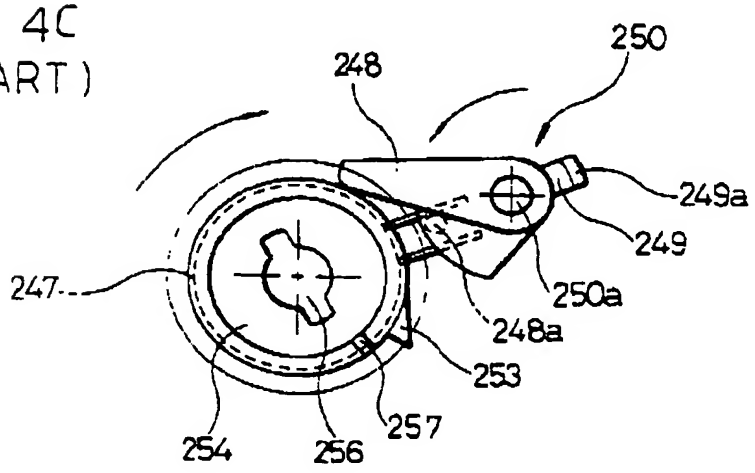


FIG. 5

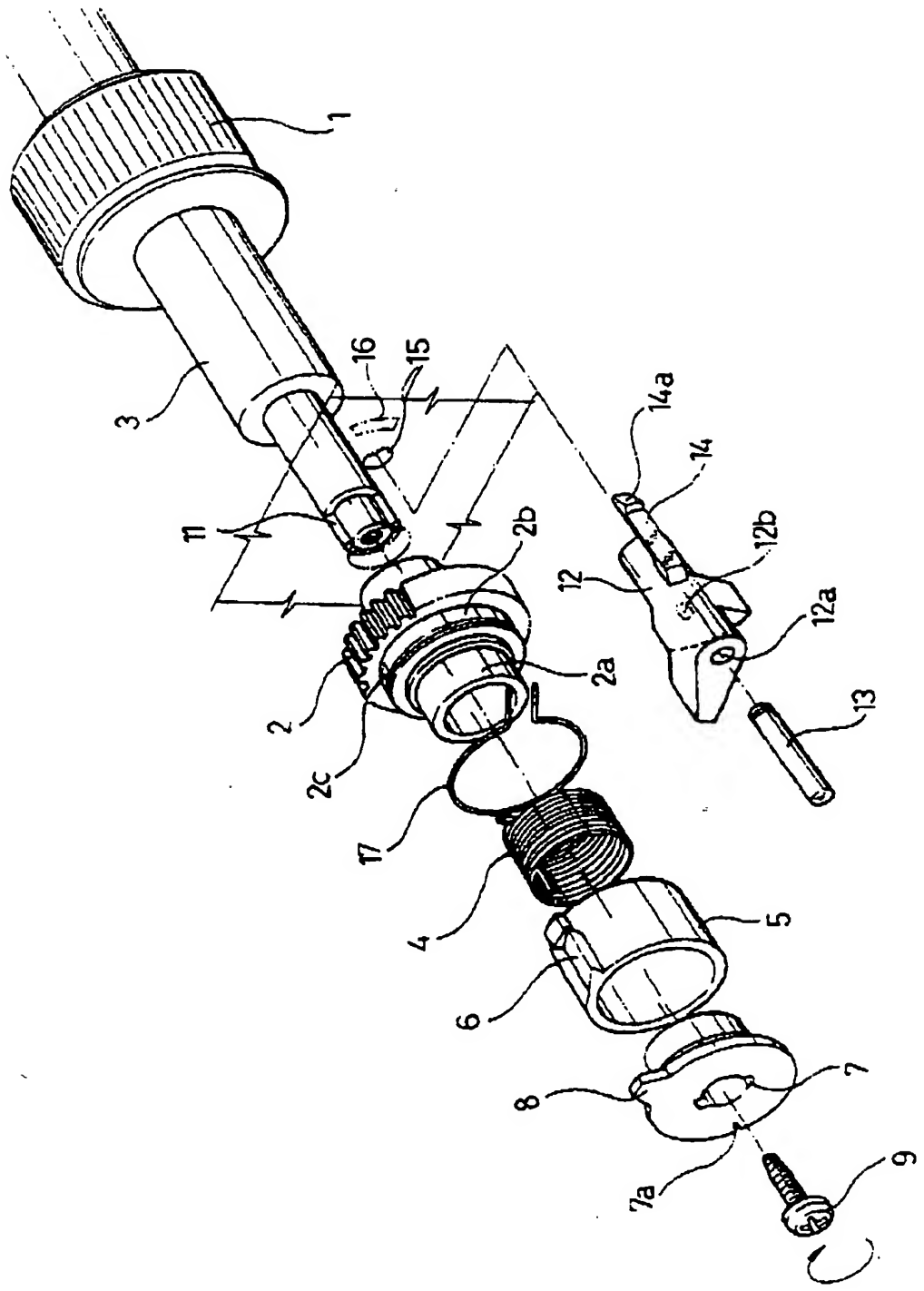


FIG. 6A

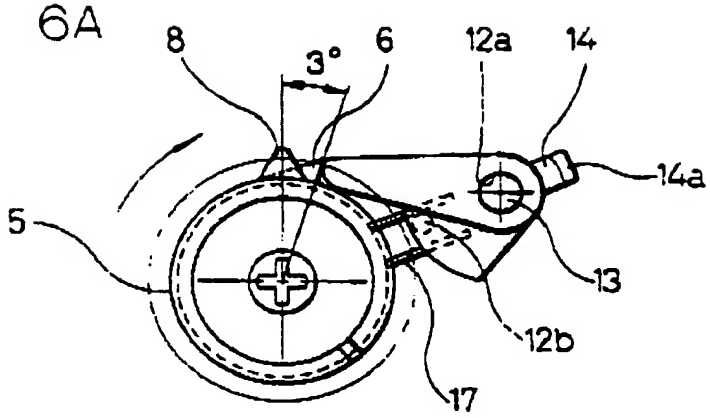


FIG. 6B

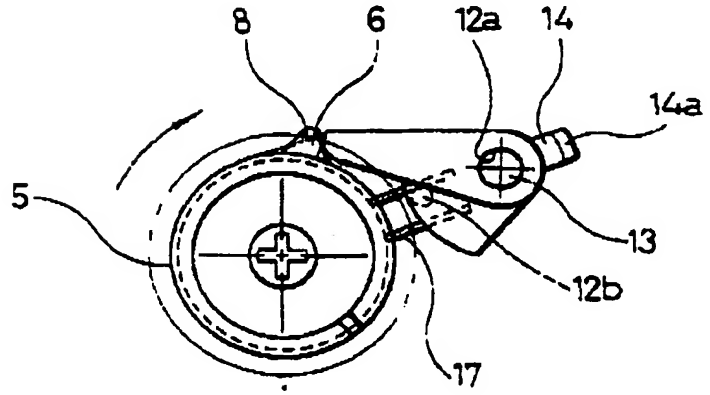


FIG. 6C

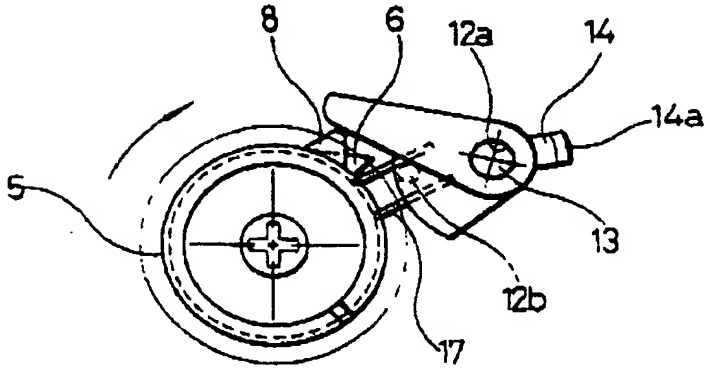


FIG. 7

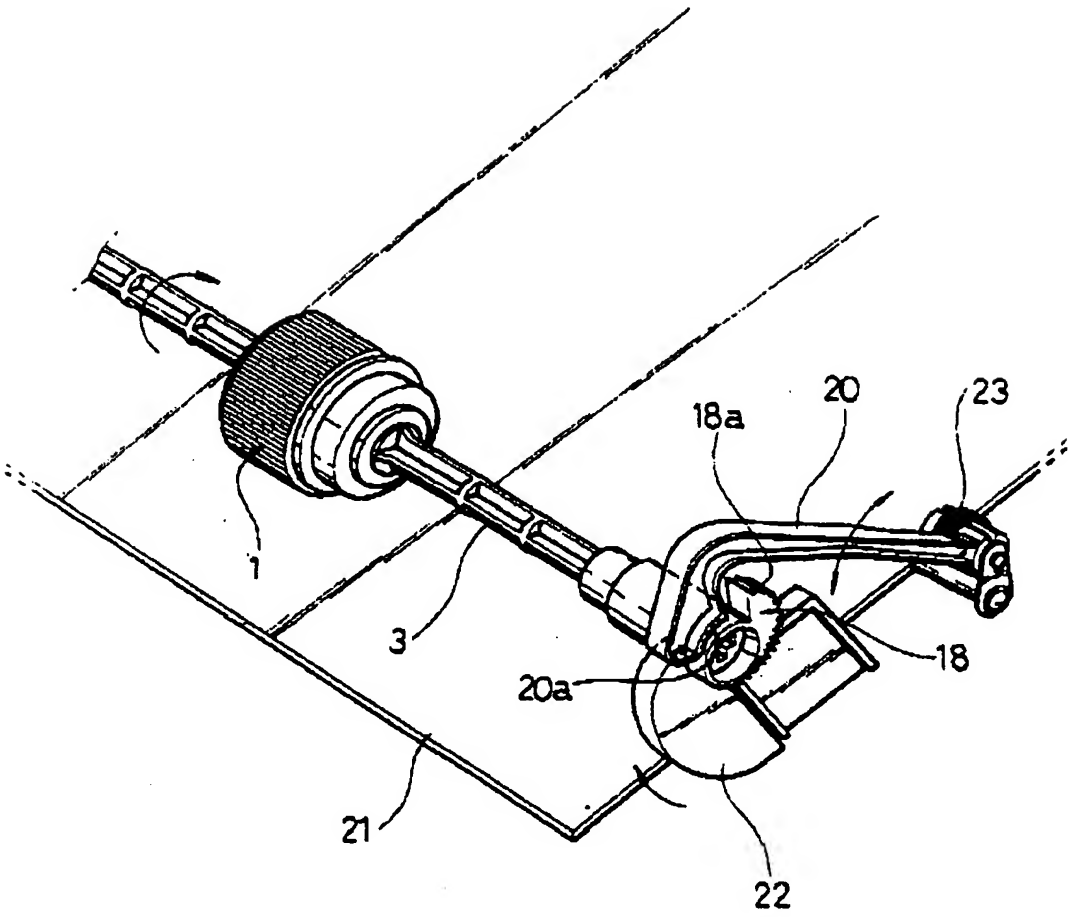
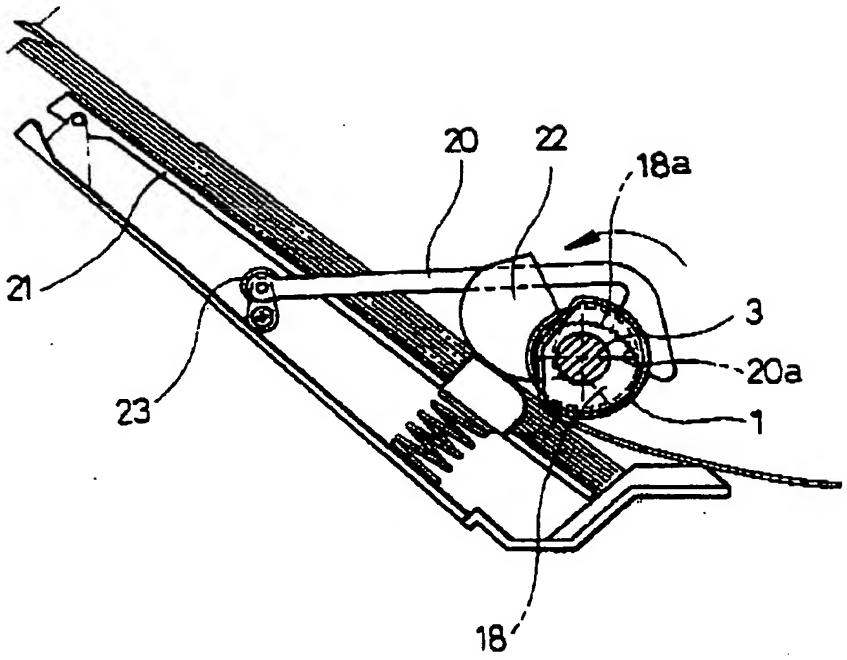


FIG. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 98 31 0035

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B65H
B41J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 March 1999	Henningsen, O

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